

This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

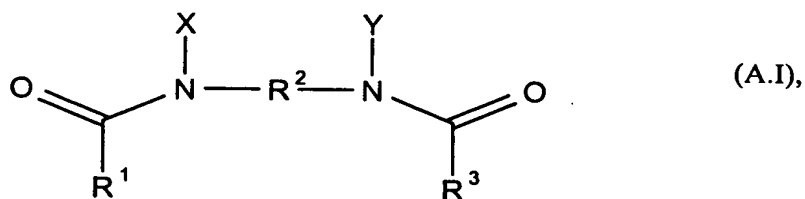
**As rescanning documents *will not* correct images,
please do not report the images to the
Image Problem Mailbox.**

CLAIMS

1. A surfactant composition comprising
 - (A) 1 to 70 wt%, referring to components (A) and (B), of one or more
5 gemini surfactant(s) and,
(B) referring to the remainder, based on the total of components (A)
and (B), one or more co-amphiphile(s) having an HLB value of
less than or equal to 6.
- 10 2. The surfactant composition of claim 1, characterized in that the surfactant
composition comprises
 - (A) 5 to 60 wt%, referring to components (A) and (B), of one or more
gemini surfactant(s) and,
(B) referring to the remainder, based on the total of components (A)
15 and (B), one or more co-amphiphile(s).
3. A surfactant composition according to any of claims 1 or 2, further
comprising
 - (C) at least 0.1 wt% water, referring to the total composition.
- 20 4. A surfactant composition according to any of claims 1 or 2, further
comprising
 - (D) at least 0.1 wt% of one or more oil component(s), referring to the
total composition.
- 25 5. A surfactant composition according to any of claims 1 or 2, wherein the
co-amphiphile is
 - a C₆- to C₄₀-alcohol,
 - a C₆- to C₂₄-carboxylic acid,
 - 30 - a sorbitan(C₆- to C₂₂-)ester,
 - a methylglucoside(C₆- to C₂₂-)ester,
 - a sugar(C₆- to C₂₂-)ester,
 - a mono-, di-, and triglyceride of a C₆- to C₂₂-carboxylic acid,
 - a lactic acid- or citric acid-esterified derivative of the mono- and
diglycerides of a C₆- to C₂₂-carboxylic acid,
 - 35 - a polyglycerol(C₆- to C₂₂-)ester,
 - a propyleneglycol(C₆- to C₂₂-)ester,

- a vitamin ester,
 - salicylic acid,
 - benzoic acid,
 - lecithin, and
 - mixtures thereof.
- 5
6. A surfactant composition according to any of claims 1 or 2 in the form of an emulsion, characterized in that the co-amphiphile is present in solid form at 25°C.
- 10
7. A surfactant composition according to any of claims 1 or 2 in the form of a dispersion, characterized in that the co-amphiphile is present in liquid form at 25°C.
- 15
8. A surfactant composition according to any of claims 1 or 2, characterized in that at least two different co-amphiphiles are employed.
9. A surfactant composition according to any of claims 1 or 2, wherein at least one co-amphiphile is
- 20
- a C₆- to C₄₀-alcohol,
 - a mono-, di-, and triglyceride of C₆- to C₂₂-carboxylic acid, and
 - mixtures thereof.
10. A surfactant composition according to claim 9, characterized in that the surfactant composition comprises
- 25
- 30 to 50 wt% of C₆- to C₄₀-alcohol,
 - 30 to 50 wt% of a mono-, di-, and triglyceride of a C₆- to C₂₂-carboxylic acid, and
 - mixtures thereof,
- 30
- each referring to the gemini surfactant/co-amphiphile(s) composition.
11. A surfactant composition according to any of claims 1 or 2 in form of an emulsion, characterized in that the surfactant composition can be produced by a method (phase transfer temperature (PTT) method), which includes at least the following step:
- 35
- combining

- (a) a composition (a) comprising the gemini surfactant (A) wherein the composition has a temperature X, with
- (b) a composition (b) comprising the co-amphiphile (B) wherein the composition has a temperature Y,
- 5 the temperature Y being greater than temperature X.
12. The surfactant composition of claim 11, characterized in that the temperature Y is not more than 15°C higher than the critical phase transfer temperature of the surfactant in composition (b).
- 10 13. Surfactant compositions according to claim 12, characterized in that the temperatures X and Y are different by at least 3°C.
14. A surfactant composition according to any of claims 1 or 2, characterized in that the gemini surfactant comprises nitrogen atoms at the link between spacer, hydrophilic, and hydrophobic group.
- 15 15. A surfactant composition according to any of claims 1 or 2, characterized in that the gemini surfactant comprises an amine- or amide-group-containing spacer with 1 to 12 carbon atoms.
- 20 16. A surfactant composition according to claim 14, characterized in that the hydrophobic double group comprises a C₆- to C₂₄-hydrocarbon residue each and/or the hydrophilic double (head) group comprises an at least monoalkoxylated residue with a sulfonic acid-, carboxylic acid-, phosphonic acid-, polyalcohol-, or polyalkylene oxide group, or salt thereof.
- 25 17. A surfactant composition according to any of claims 1 or 2, characterized in that the surfactant composition comprises 0.01 to 30 wt%, preferably 0.1 to 6 wt% of the components (A) and (B), referring to the total composition.
- 30 18. A surfactant composition according to any of claims 1 or 2, characterized in that the gemini surfactant has the general formula (A.I)
- 35



wherein the substituents have the following meanings:

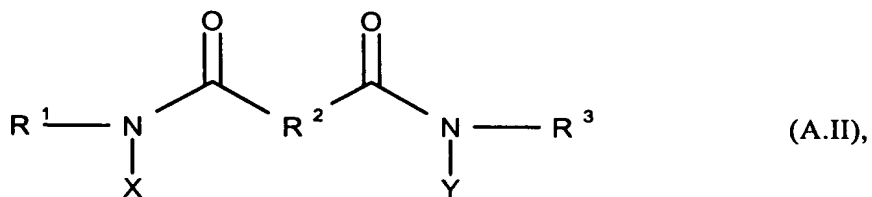
R¹, R³ C₅- to C₂₅-alkyl group that can be branched, unbranched, saturated, or unsaturated as far as not adjacently diunsaturated;

R² C₁- to C₁₂-alkylene;

X, Y (C₂H₄O-)_x(C₃H₆O-)_y-FR; x+y ≥ 1,
x: 0-15, y: 0-10 ; and

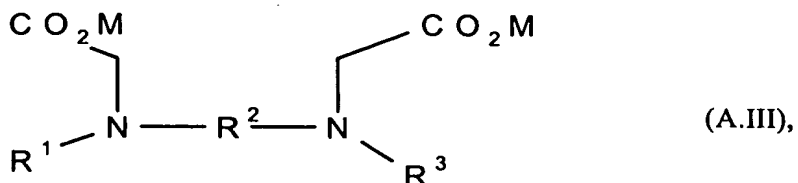
FR -SO₃M, -CH₂-CO₂M, -P(O)(OM)₂, H, -C₃H₆SO₃M,
-CH₂(CHOH)₄CH₂OH, insofar as x+y=0,
wherein M = alkali, (alkyl)ammonium, alkanol ammonium,
H, or ½ alkaline earth.

19. A surfactant composition according to any of claims 1 or 2, characterized in that the gemini surfactant has the general formula (A.II)



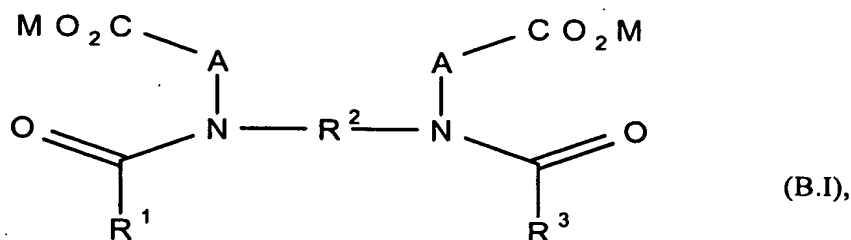
wherein the substituents have the meanings as defined by the general formula (A.I).

20. A surfactant composition according to any of claims 1 or 2, characterized in that the gemini surfactant has the general formula (A.III)



wherein the substituents have the meanings as defined by the general formula (A.I).

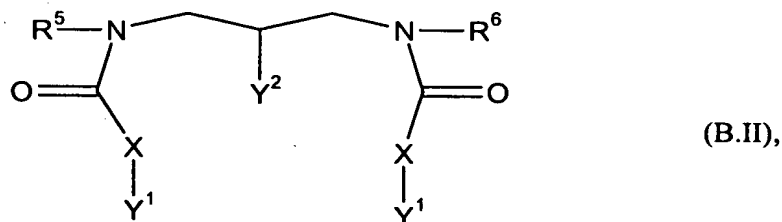
21. A surfactant composition according to any of claims 1 or 2, characterized in that the gemini surfactant has the general formula (B.I)



wherein the substituents have the following meanings:

- R¹, R³** C₅- to C₂₅-alkyl group that can be branched, unbranched, saturated, or unsaturated as far as not adjacently diunsaturated;
- R²** C₁- to C₁₂-alkylene
- A** CHR⁴, CH₂, C₂H₄, C₃H₆, C₄H₈;
- R⁴** aminocarboxylic acid radical, and
- M** alkali, (alkyl)ammonium, alkanol ammonium, H, or ½ alkaline earth.

22. A surfactant composition according to any of claims 1 or 2, characterized in that the gemini surfactant has the general formula (B.II)

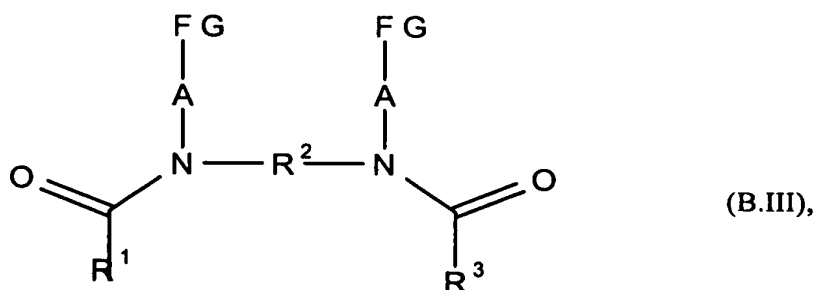


wherein the substituents have the meanings as defined by the general formula (B.I), and

- R⁵, R⁶** represent a C₆- to C₃₆-alkyl group that can be branched, unbranched, saturated, or unsaturated as far as not adjacently diunsaturated;

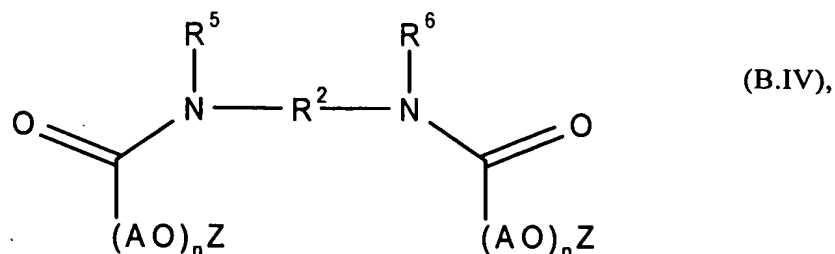
X is an alkylene- or alkenylene group having from 1 to 6 carbon atoms, which may be substituted with a hydroxyl group or a sulfonic acid group or a carboxy group;
Y¹ is a sulfonate- or sulfate group or a carboxyl group, and
Y² represents a hydroxyl group, a sulfuric acid residue, or -O-(CO)X-COOH.

23. A surfactant composition according to any of claims 1 or 2, characterized in that the gemini surfactant has the general formula (B.III)



- wherein the substituents have the meanings as defined by the general formula (B.I) of , and
FG represents -COOM or -SO₃M.

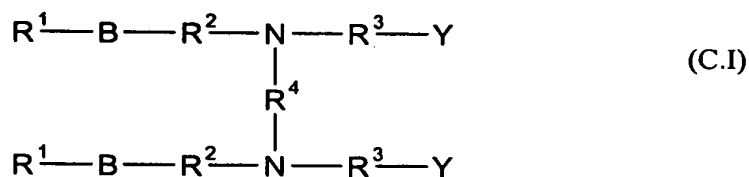
24. A surfactant composition according to any of claims 1 or 2, characterized in that the gemini surfactant has the general formula (B.IV)



- wherein the substituents have the meanings as defined by the general formulas (B.I) and (B.II) and
AO represents alkylene oxide units wherein n = 1 to 20, and

Z is $-\text{SO}_3\text{M}$, $-\text{C}_2\text{H}_4\text{SO}_3\text{M}$, $-\text{C}_3\text{H}_6\text{SO}_3\text{M}$, $-\text{P}(\text{O})(\text{OM})_2$, $-\text{CH}_2-\text{COOM}$, or $-\text{C}_2\text{H}_4-\text{COOM}$.

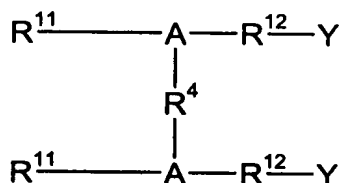
25. A surfactant composition according to any of claims 1 or 2, characterized in that the gemini surfactant has the general formula (C.I),



wherein the substituents have the following meanings:

- R¹** C₅- to C₂₅-alkyl group that can be branched, unbranched, saturated, or unsaturated as far as not adjacently diunsaturated, hydroxy-substituted or perfluorinated;
- R²** C₁- to C₁₂-alkylene or hydroxy-substituted derivatives thereof;
- B** an amide group, a carboxyl group, or a polyether group;
- R⁵** C₁- to C₄-alkyl, hydroxy-substituted alkyl, or H;
- R⁶** C₂- to C₄-alkylene;
- x** a number from 1 to 20;
- R³** C₁- to C₁₂-alkyl or hydroxy-substituted derivatives thereof, R⁷-D-R⁷, or a polyether group;
- R⁷** C₁- to C₆-alkylene or hydroxy-substituted derivatives thereof;
- D** -O-, -S-, -N(R⁸)-;
- R⁴** alkylene or alkylaryl having from 1 to 12 carbon atoms, the hydroxy-substituted derivatives, or R⁹-D¹-R⁹;
- R⁸** C₁- to C₁₂-alkyl or hydroxy-substituted alkyl, H, or R⁹-D¹-R⁹;
- R⁹** C₁- to C₆-alkylene, hydroxy-substituted derivatives thereof, or aryl;
- D¹** -O-, -S-, -SO₂-, -C(O)-, [-O(R⁷-O)_x-], (R¹⁰)_t[N(R¹⁰)]_z, or aryl;
- R¹⁰** C₁- to C₁₂-alkyl, hydroxy-substituted alkyl, H, or aryl;
- t, z** are independently a number from 1 to 4; and
- Y** is independently -SO₃H, -O-SO₃H, -OP(O)(OH)₂, -P(O)(OH)₂, -COOH, -CO₂-C₆H₄-SO₃H, or the salts thereof.

26. A surfactant composition according to any of claims 1 or 2, characterized in that the gemini surfactant has the general formula (C.II)



(C.II),

wherein the substituents have the meanings as defined by the general formula (C.I), and

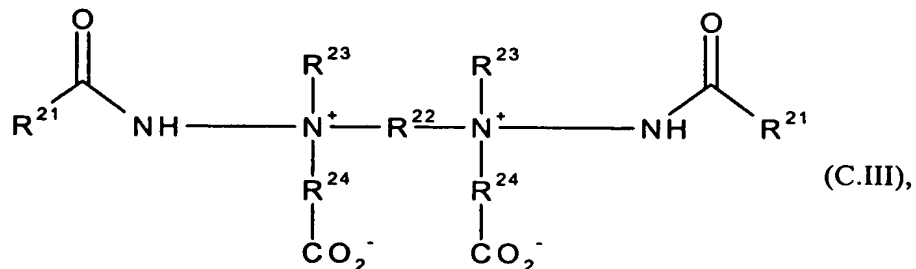
R^{11} is a C_5 - to C_{23} -alkyl group that can be branched, unbranched, saturated, unsaturated as far as not adjacently diunsaturated, hydroxy-substituted, or perfluorinated or R^{14} -B- R^2 ;

R^{14} is a C_1 - to C_{12} -alkyl group that can be branched, unbranched, saturated, unsaturated as far as not adjacently diunsaturated, or the hydroxy-substituted derivatives;

R^{12} means a C_1 - to C_{12} -alkylene group that can be branched, unbranched, saturated, unsaturated as far as not adjacently diunsaturated, the hydroxy-substituted derivatives, or an amide group, a carboxyl group, a polyether group; and

A is $-CR^6=$ or $-N=$, if whenever A is equal to $-N=$, R^{11} represents R^{14} -B- R^2 .

27. A surfactant composition according to any of claims 1 or 2, characterized in that the gemini surfactant has the general formula (C.III)



(C.III),

wherein the substituents have the meanings as defined by the general formulas (C.I) and (C.II) and

R²¹

represents a C₅- to C₂₃-alkyl group that can be branched, unbranched, saturated, or unsaturated as far as not adjacently diunsaturated;

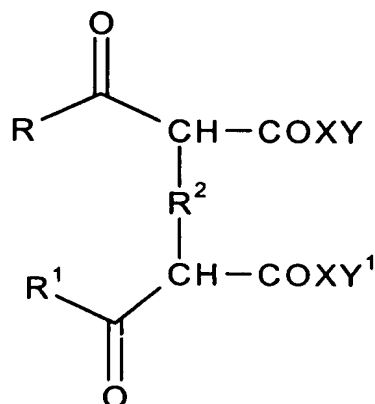
R²², R²⁴

are C₁- to C₆-alkylene;

R²³

is methyl, ethyl, propyl, or a polyether group.

28. A surfactant composition according to any one of claims 1 or 2, characterized in that the gemini surfactant has the general formula (D.I)



(D.I),

wherein the substituents have the following meanings:

R, R¹

C₅- to C₃₀-alkyl group that can be branched, unbranched, saturated, unsaturated as far as not adjacently diunsaturated, hydroxy-substituted, or perfluorinated;

R²

C₁- to C₁₀-alkylene, arylene, the hydroxy-substituted derivatives thereof, a polyether, -S-, -SO₂-, -O-, -S-S-, -O-R⁵-O-, or -S-R⁵-S-; variable for a direct bond between the two α-carbons;

R⁴

C₂- to C₄-alkylene;

R⁵

C₁- to C₁₀-alkylene, arylene, or alkyl arylene, -N(R⁶)-, or -(NR⁶)-R⁷-(NR⁶)-;

R⁶

C₁- to C₆-alkyl;

R⁷

C₁- to C₆-alkyl, wherein R⁷ and R⁶ can also be part of a heterocyclic ring;

X

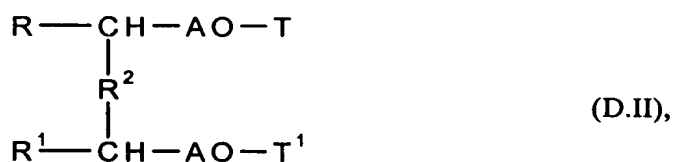
polyether, wherein x is a number from 1 to 30, -O-, NZ;

Z

C₁- to C₁₀-alkyl, aryl, alkylaryl, or H, and

Y, Y¹ are independently H, -CH₂-COOH and salts, a hydrocarbon radical having at least two hydroxyl groups.

29. A surfactant composition according to any of claims 1 or 2, characterized in that the gemini surfactant has the general formula (D.II)



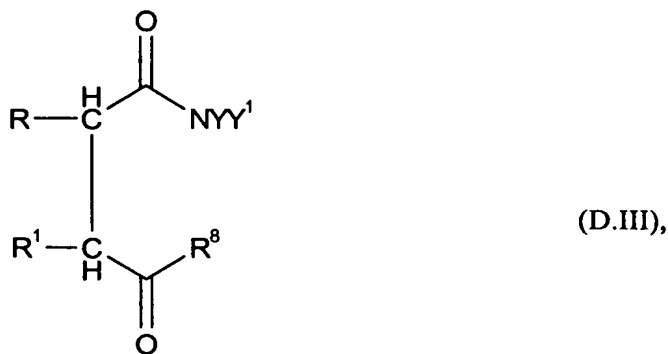
wherein the substituents have the meanings as defined by the general formula (D.I) and

AO means -C(O)-, -C(O)- [-O(R⁴O)_x]-, -CH₂-[-O(R⁴O)_x]-, -CH₂-O-;

T, T¹ are independently -OM, -H, -CH₃, -C₂H₅, -SO₃M, -CH₂COOM, -C₂H₄-COOM, -C₃H₆-SO₃M, -O-P(O)(OM)₂; and

M is alkyl, ½ alkaline earth, ammonium, mono-, di-, trialkanolammonium, or H.

30. A surfactant composition according to any of claims 1 or 2, characterized in that the gemini surfactant has the general formula (D.III)

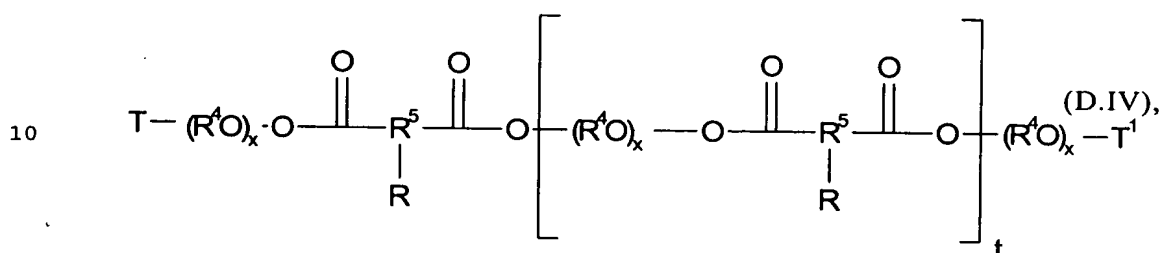


wherein the substituents have the meanings as defined by the general formulas (D.I) and (D.II) and

R⁸ represents NYY¹, -O(R⁴O)_xH or -O(R⁴O)_x-C(O)-CHR-CHR¹-C(O)NYY¹.

31. A surfactant composition according to any of claims 1 or 2, characterized in that the gemini surfactant has the general formula (D.IV)

5



15

wherein the substituents have the meanings as defined by the general formulas (D.I), (D.II), and (D.III) and

t is an integer from 1 to 100, preferably 1 to 20, most preferably 1 to 4.

32. The surfactant composition of claim 1 wherein said one or more gemini surfactants are present in an amount of from 10 to 60 wt%.
33. The surfactant composition of claim 2 wherein said one or more gemini surfactants are present in an amount of from 10 to 50 wt%.
34. The surfactant composition of claim 5 wherein said alcohol is a C₈- to C₂₄-alcohol.
35. The surfactant composition of claim 5 wherein said carboxylic acid is a C₈- to C₂₂-carboxylic acid.
36. The surfactant composition of claim 8 wherein 3 to 5 different co-amphiphiles are employed.
37. The surfactant composition of claim 9 wherein said alcohol is a C₈- to C₂₄-alcohol.

38. The surfactant composition of claim 10 wherein said alcohol is a C₈- to C₂₄-alcohol.
- 5 39. The surfactant composition of claim 11 wherein said composition (a) contains water.
40. The surfactant composition of claim 11 wherein said composition (b) contains an oil component.
- 10 41. The surfactant composition of claim 13 wherein the temperatures X and Y are different by at least 5°.
42. The surfactant composition of claim 17 wherein the surfactant composition comprises 0.1 to 6 wt% of the components (A) and (B),
15 referring to the total composition.
43. The surfactant composition of claim 24 wherein said alkylene oxide units is selected from the class consisting of ethylene glycol-, propylene glycol-, butylene glycol ether units, and mixtures thereof.
20
44. The surfactant composition of claim 24 wherein said alkylene oxide units comprise a single species.
45. The surfactant composition of claim 24 wherein said alkylene oxide units
25 comprise multiple species.
46. The surfactant composition of claim 45 wherein said multiple species are randomly arranged.
- 30 47. The surfactant composition of claim 45 wherein said alkylene oxide units are arranged in block form.
48. The surfactant composition of claim 28 wherein said hydrocarbon radical having at least two hydroxy groups is selected from the class consisting of
35 erythrose, threose, ribose, arabinose, xylose, fructose, lyxose, allose, altrose, glucose, mannose, galactose, and mixtures thereof.